

« *Vegetables and fruits - from latest science to policy in action* »

## Editorial

There is strong evidence that vegetables, fruits and other foods containing dietary fibre protect against a range of cancers as well as protecting against weight gain and obesity. Because of this one of the World Cancer Research Fund's 10 Recommendations for Cancer Prevention is "Eat more of a variety of vegetables, fruits, whole grains, and pulses such as beans". But research is still a long way from knowing exactly how such plant foods exert a protective effect. New approaches to better understand the complex interactions that lead to cancer and the beneficial effects of fruits and vegetables and other plant foods are under way and hold promise for the future, as outlined in the first article.

Cancer can take many years, indeed decades, to develop and so it's important to start young when developing healthy eating habits. After the family, schools usually have the greatest influence on children. Schools help shape habits and ways of life that can often persist into adulthood. For this reason schools are identified as a key actor group in the WCRF Policy Report, Policy and Action for Cancer Prevention.

School based initiatives have been used in many countries to help increase children's fruit and vegetable consumption. The second article examines why these initiatives work, why sometimes they don't and what can be done to design more effective policies to boost fruit and vegetable intake in schools.

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# Vegetables, fruits and cancer: where are we now?

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## Overview

Perhaps the most recognised of health messages is “at least 5 a day” for portions of vegetables and fruits, based on epidemiologic and laboratory studies linking higher intake of these foods with lower risk of heart disease and some cancers.

The 1997 expert report from the World Cancer Research Fund (WCRF) and the American Institute for Cancer Research (AICR) found convincing evidence that higher intake of vegetables and fruits reduced risk of several cancers. In 2007, the second WCRF/AICR expert report re-evaluated the evidence. This review – the most comprehensive and rigorous of its type – was more cautious in ascribing causal effect, but nevertheless considered the evidence strong enough to make recommendations<sup>1</sup>.

The evidence supporting these (and other) recommendations is now being updated as part of the WCRF International Continuous Update Project (CUP), and is judged by an independent expert panel, which will draw conclusions and make recommendations.

## Current knowledge

The most recent conclusions from the independent Expert Panels for the 2007 report and the CUP are that higher intakes of vegetables and fruits probably reduce risk of cancers of the mouth, larynx and pharynx, oesophagus, lung and stomach. These cancers have well-established external causes – tobacco, alcohol and infection. While the most well known mechanisms proposed for a beneficial effect of vegetables and fruits focus on their antioxidant potential, there is increasing interest in possible interactions between several plant constituents and infectious agents. For example, evidence is accumulating for a subtle impact of folate status in modulating the response to infection with the human papilloma virus, a known cause of some head and neck cancers as well as cervical cancer<sup>2</sup>.

## The methodological challenge

Better description of the molecular mechanisms underpinning cancers, in particular those related to infection, will bring about a more sophisticated understanding of the complex

interactions that eventually lead to cancer. But this is just the beginning of an enormous shift in how the roles of individual food components, foods or patterns of diets in health in general and cancer in particular are perceived.

There are imperfect tools for establishing levels of consumption of vegetables and fruits and their various bioactive constituents. What is required is to establish such exposure over decades, and to discriminate between different types of vegetables and fruits, with precision and accuracy. The tools currently available enable strong conclusions to be drawn for broad categories of vegetables or fruits, but are far from being able to pinpoint specific molecular effects. In the future, integration of molecular techniques into epidemiologic and clinical studies has great potential to increase this understanding.

## A holistic approach

In the face of these obstacles, what can be said? Most dietary characteristics are in some way associated with each other – people who eat more of one type of vegetable are more likely to eat another; those who eat plenty of plant foods often eat less animal products; and people who follow a healthy dietary pattern tend to smoke less and be more physically active. This suggests a cautious approach to making recommendations – WCRF recommends at least five portions of non-starchy vegetables and fruits a day as part of a broad approach, to “eat mostly foods of plant origin”, taking account of the impact of whole grains and pulses, and of plant foods in general being low in energy and useful for body weight maintenance. This recommendation, together with recommendations to limit intake of meat, alcohol and salt, is itself part of a more holistic approach to a healthy pattern of diet and other behaviours including physical activity.

The evidence that vegetables and fruits help prevent certain types of cancer is strong enough to recommend their consumption, but confidence in the impact will be increased by adopting as many recommendations as possible, as part of a pattern of healthy behaviour. Several studies have shown that the more people follow the WCRF/AICR recommendations, the lower is their risk not just of cancers but also other chronic diseases. Vegetables and fruits are a key marker of this healthy lifestyle.



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# Why are fruit and vegetable initiatives in schools effective (and why are they sometimes not)?

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## Vegetables can be a hard sell

"My kids just don't like vegetables." How many times have you heard that!

Anyone who has ever been around infants and young children will know vegetables are a tougher sell than many other foods. They get thrown on the floor. They get pushed to the side of the plate. They get left to the end of the meal. Many fruits can be a tough sell too. It's hardly surprising that people in most countries around the world are still not eating enough vegetables and fruits for optimum health.

Parents shouldn't feel guilty though, or be unduly harsh on the children, because it's routed in science. Biologically it is easier to like sweet, energy-dense foods.

## Effective programmes

This is always going to make vegetables and fruits – especially vegetables – a harder sell for children. At the same time, it is known that actions to promote fruit and vegetable consumption can work. Take the evidence from studies of school-based programmes.

Systematic reviews of the evidence show these can be effective<sup>1-4</sup>. National school fruit and vegetable programmes show positive results; 18 of 21 EU Member States that reported on the results on the EU School Fruit Scheme reported positive impacts on consumption<sup>5</sup>; so did the evaluation of the Fresh Fruit and Vegetable Programme in the United States<sup>6</sup>.

## Overcoming barriers to access

So given that fruits and vegetables can be a hard sell, why do these programmes work? A leading reason is that they overcome barriers to access for kids actually like fruits and vegetables but who don't get enough at home. Increases of intake are often higher among children who initially eat less, suggesting that the programmes are removing a constraint to access<sup>5-7</sup>. Evidence from free schemes also suggests they enhance access. The free scheme that was in place in Norway until recently was used by all socioeconomic groups – effectively reducing inequalities in intake. In contrast, the subsidised scheme also in place was used mainly by children of higher socioeconomic status who already consume a lot of fruits and vegetables, and therefore had little impact on access<sup>8</sup>.

## An opportunity for healthy preference learning

A second leading reason that they can help fruit and vegetable programmes work is that children learn to like fruits and vegetables. There is strong evidence that when children are repeatedly exposed to tasty vegetables and fruits, their liking increases, and this then leads to

greater consumption at the time and later in life<sup>9</sup>. By exposing kids to fruits and vegetables and providing the opportunity for repeat tasting opportunities, these programmes can have the effect of increasing preferences for fruits and vegetables.

This is clearly shown by evaluations of programmes which measure preferences as an outcome: before the programmes, kids say they don't like the produce; afterwards they say they do<sup>10</sup>. The Food Dudes programme is explicitly based on the science of preference formation and uses exposure combined with modelling and rewards to effectively boost consumption<sup>11</sup>. This is good news because it means children take their preferences home with them and don't eat less at other times of day. Indeed, many studies show positive impacts on total daily intake<sup>3</sup>.

***"When children are repeatedly exposed to tasty vegetables and fruits, their liking increases"***

## The need for sustained action

The picture isn't entirely rosy, however. The effects are relatively modest – the most recent meta-analysis showed an effect of 0.32 portions per day for children aged 5-12<sup>3</sup>. However, this would be

expected when the main challenge is low preferences at baseline since preferences take time to form and change. As shown by an intervention in the Netherlands, programmes which provide opportunities for repeated exposure are more likely to be effective over the longer term<sup>12</sup>. Therefore it seems that to have a sustained effect, initiatives need to run over several years<sup>2</sup>.

Modest impacts could also be expected when initiatives act to overcome barriers to access. This is because of problems beyond the school gate. For example, a study of First Nation Canadians showed that a multi-component fruit and vegetable programme significantly improved preferences for vegetables and fruit in the participating students yet did not improve self-efficacy to consume<sup>13</sup>. This finding was attributed in part to community-level barriers to healthy eating.

## Heterogeneity of effects

Along with modest outcomes, there is also a lot of variability. While many programmes work, some do not. In addition, some elements appear effective in some circumstances but ineffective in others. For example, evaluation of the Northern Fruit and Vegetable Pilot Programme in Canada found no evidence that including education in a free scheme boosted effectiveness<sup>10</sup>. Yet in other cases, educational programmes have been found to be effective in changing preferences<sup>14</sup>.

## Multi-component approaches

The evidence indicates that the effects of fruit and

# Why are fruit and vegetable initiatives in schools effective (and why are they sometimes not)?

vegetable initiatives depends on whether they are adequately tailored to the target population. For example, initiatives that create access won't make any difference for children who already eat enough at home; repeat exposure won't make any difference to children who already like them; education won't work if the kids don't like the produce. This likely explains why "multi-component" approaches have, on balance, proved more effective – because they capture the variations within and

between children in individual schools<sup>2,4</sup>.

Programmes to promote fruit and vegetable intake in schools are much more likely to work when they are based on an understanding of the mechanisms through which they can have an effect, such as creating access and/or preference learning. Paying greater attention to the characteristics of young children in schools could go a long way in helping design more effective policies and programmes to boost fruit and vegetable consumption.



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